**To:** CN=Glenn Suter/OU=CI/O=USEPA/C=US@EPA[]
**Cc:** CN=Phil North/OU=R10/O=USEPA/C=US@EPA[]
**Bcc:** []
**From:** CN=Barbara Butler/OU=CI/O=USEPA/C=US
**Sent:** Tue 8/23/2011 12:55:56 PM
**Subject:** Re: Leach tests

Oops! Here it is.

[attachment "Pebble_Project_Preliminary Assessment Technical Report_February 17 2011.pdf" deleted by Glenn Suter/CI/USEPA/US]

From: Glenn Suter/CI/USEPA/US
To: Barbara Butler/CI/USEPA/US@EPA
Date: 08/23/2011 08:53 AM
Subject: Re: Leach tests

Thanks Barbara for this analysis.
The report was not attached.

From: Barbara Butler/CI/USEPA/US
To: Glenn Suter/CI/USEPA/US@EPA, Phil North/R10/USEPA/US@EPA
Date: 08/23/2011 07:58 AM
Subject: Re: Leach tests

Hi Phil and Glenn,

Here is some information from the Pebble Project Preliminary Assessment Technical Report, Feb 2011 related to their materials and acid leaching potential and how they plan to manage the materials. I think Jeff sent this out, but I have attached it to this email as well. I haven't checked to see if it is on Quickr.

Figure 1.8.1 and text discussion on page 49 indicates that it is known there are going to be acid-generating materials from mining the Pebble Deposit. The statement of "Bulk tailings solids are benign, whereas the pyrite-rich cleaner scavenger tailings could generate acidic conditions if allowed to oxidize." To remedy the anticipated acid generation potential, they further state "To ensure that oxidation of the cleaner scavenger tailings does not occur, tailings management practices will include encapsulation of the cleaner scavenger tailings within the accreting bulk tailings deposit and sub-aqueous storage within the tailings pond." They plan to use sub-aqueous disposal to "...eliminate the potential for these tailings to react to create acidic conditions" (page 51). [NOTE: subaqueous disposal will not eliminate the potential for acid production, but it will minimize it; there is still potential for it to occur if there is oxygen in the water column]. On page 52, they say there will be 2.4 billion tons of non-acid generating waste rock and 0.6 billion tons of potentially acid generating waste rock during the 25-year case. Separate waste piles will be constructed and the PAG waste pile will be processed at the end of mining operations to remove the low-grade copper and then tailings disposed in the open pit. These are mitigation measures that could be expected at any metal mine.

On page 353, there is a statement of "Static geochemical testing indicates that the bulk rougher flotation tailings can be produced with low sulphur concentrations of between 0.1% and 0.2% sulphur as sulphide, and sufficient carbonate content to offset acid generating potential. No geochemical testing has been completed on the cleaner scavenging tailings. However, the pyrite content of these tailings indicates that they may have potential to create acidic conditions if permitted to oxidize." Static testing includes total elemental analyses and acid/base accounting (ABA) and are used as a screening to determine materials that may need assessment via kinetic testing [I am confused, as this is a 2011 report and the 2009 document includes kinetic testing, and stated as being on the scavenger tailings, so they should have determined already the samples needing kinetic tests?].

Acidic drainage will only result if the rate of acid generation exceeds the rate of neutralization [but this is not to say there won't be metals leached - plenty of neutral mine drainage has metal/metalloid/non-metal concentrations present, it is the pH that controls whether these are mobile or not]. ABA analyses and calculations are used to predict if there is sufficient neutralization potential to offset the acid producing potential. Kinetic tests can take years to complete, but they are used to predict influences of time, moisture, and flows on leaching of ions from the minerals. Used with the static tests, these are very helpful in interpreting results and what might be expected to occur.

On page 353, there is a statement of "Sulphur and calcium results from the analyses show that these elements are the best surrogates for determining acid potential (AP) and neutralizing potential (NP). Based on results from kinetic tests, any rock with an NP/AP ratio greater than 1.6 or 1.8 for pre-Tertiary and Tertiary rock, respectively, is predicted to be not potentially acid generating (NAG)."

From MEND (2009, attached): If the acid potential (AP) is identical to that produced by pyrite and neutralization potential (NP) is exactly like calcite, the following are used for classification of materials: net potential ratio (NPR = NP/AP) < 1.0 are potentially acid generating; with an NPR greater > 2.0, they are non-acid-generating; if in between 1 and 2, they are capable of acid production. "The onset of ARD may occur in a few years or take hundreds of years. The absence of ARD up to the present does not on its own prove ARD will not occur in the future". I added bold - and this entire quotation would be good for inclusion in the scenario to express known limitations.

On page 409 (Pebble) they state that about 85% of the tailings produced are benign and that at closure, they will place NAG waste rock on exposed tailings beaches to a depth of one meter and then revegetate the surface. This is a mitigation measure that is applicable to any tailings facility of this type of mining, although the depth of the NAG might vary.

**Ex. 5 - Deliberative**

**Ex. 5 - Deliberative**

Ex. 5 - Deliberative

Sorry this is long, but hopefully it is helpful.

Barb

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Barbara A. Butler, PhD
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From: Barbara Butler/CI/USEPA/US
To: Glenn Suter/CI/USEPA/US@EPA
Cc: Phil North/R10/USEPA/US@EPA
Date: 08/22/2011 12:16 PM
Subject: Re: Leach tests

Hi Glenn and Phil,

I'll have a look at this later today or tomorrow. I'm working from home today and reviewing a manual for one of my projects that is requiring a lot more time and revision than I anticipated.

Ex. 5 - Deliberative

More later,
Barb

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Barbara A. Butler, PhD
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-----Glenn Suter/CI/USEPA/US wrote: -----
To: Phil North/R10/USEPA/US@EPA
From: Glenn Suter/CI/USEPA/US
Date: 08/19/2011 09:39PM
Cc: Barbara Butler/CI/USEPA/US@EPA
Subject: Re: Leach tests

Thanks Phil for raising this issue.
Barbara, can you look at this and let the rest of us know what you think?

Phil North---08/19/2011 09:09:58 PM---**Ex. 5 - Deliberative**

**Ex. 5 - Deliberative**

From:
Phil North/R10/USEPA/US

To:
Glenn Suter/CI/USEPA/US@EPA

Cc:
Barbara Butler/CI/USEPA/US@EPA

Date:
08/19/2011 09:09 PM

Subject:
Leach tests

Glenn and Barbara,

# Ex. 5 - Deliberative

Phil

[attachment "Status of Kinetic Test Program - SRK 14Sep09.pdf" deleted by Glenn Suter/CI/USEPA/US]

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"To protect your rivers, protect your mountains."